

第 1561 回 天文学教室談話会

2015 年 6 月 9 日 (火) 16:30 より

東京大学理学部 1 号館西棟 11 階 1109 号室 (天文学専攻会議室) にて

“Gauging the Universe with Classical Cepheids:
from galactic structures to the cosmic acceleration”

Laura Inno

Classical Cepheids are the most precise stellar distance indicators to date: they play a fundamental role in the calibration of the cosmic distance ladder and in the determination of the local expansion rate of the Universe. However, we still lack a firm understanding and control of the systematics affecting the Cepheid distance estimates. In this talk, I will review the physics underlying the Cepheid Period-Luminosity (PL) and Period-Wesenheit (PW) relations, which are generally adopted to determine Cepheid distances. In particular, I will show that near-infrared (NIR) PW relations are reddening independent, minimally affected by metallicity, and linear over the entire period range, with a very low dispersion. These relations are then the best suited tool to derive Cepheid distances to high precision. For this reason, we recently developed new light-curve templates that provide accurate mean magnitudes from single-epoch observations in the NIR bands. By applying these new templates and by adopting the PW we derived, it is possible to obtain Cepheids distances with an accuracy which is only limited by the method itself. I will then discuss an application of the templates to IRSF/SIRIUS data for Magellanic Cloud Cepheids, in order to derive the geometry and the three-dimensional distribution of the young stellar populations of the Magellanic Clouds, as prototype of interacting dwarf galaxies. Cepheids are indeed perfect tracers of the young stellar population, because their evolutionary status is well known and their age can be precisely determined on the basis of period-age relations. This feature, together with their use as standard candles, make Cepheids a perfect tool to probe the Galactic structure and to provide constraints on the recent Galactic chemo-dynamical evolution. I will then present the main results on this topics recently obtained by our group. Finally, I will discuss the major role that Cepheids are going to play in the light of GAIA, not only for our understanding of the Milky Way but also for establishing the nature of the Universe itself.